PRINCIPLES OF HAND REHABILITATION

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HAND THERAPY

• Hand therapy is the art and science of rehabilitation of the shoulder, elbow and hand of the human body

• Goals of Hand Therapy
  • Prevention of dysfunction
  • Restoration of function
  • Reversal of the progression of pathology

• Participation in ADLs

• (Adapted from the Hand Therapy Certification Commission HTCC)
WHO ARE CERTIFIED HAND THERAPISTS?

• Physical Therapists
  And
• Occupational Therapists
EVALUATION

- OBSERVATION
EVALUATION

- Pain

EVALUATION

- RANGE OF MOTION
EVALUATION

- STRENGTH ASSESSMENT

✓ Manual muscle Testing
EVALUATION

- STRENGTH ASSESSMENT

✓ Hand-Held Dynamometry

EVALUATION

- STRENGTH ASSESSMENT

✔ Grip strength


Strength Testing

• Five Level Grip Test
  • One Trial on each of the five handle –width settings
  • **Strongest Grip is at the 2\textsuperscript{nd} and 3\textsuperscript{rd}, weakest grip is at the most narrow and widest setting**

• Rapid Grip Exchange
  • Examiner rapidly tests the grip strength alternating from right and left hands for 10 trials
  • Thought to limit voluntary control of grip strength
EVALUATION

- STRENGTH ASSESSMENT

✔ Pinch strength: Key pinch, 3-point pinch


EVALUATION

- Sensory evaluation: 2-point discrimination

Normal: less than 6 mm
Fair: 6 to 10 mm
Poor: 11-15 mm
Protective: One point perceived
Anesthetic: No points perceived.
EVALUATION

- Sensory evaluation: 2-point discrimination

  - 6 mm required for winding a watch
  - 6-8 mm required for sewing
  - 12 mm for handling precision tools
  - 15 mm gross tool handling
EVALUATION

- Sensory evaluation: Semmes-Weinstein monofilaments

1. Green (Normal):
2. Blue (Diminished light touch)
3. Purple (Diminished protective sensation)
4. Red (loss of protective sensation)
5. Red-Lined (insensate)
EVALUATION

- Edema evaluation
EVALUATION

- Special tests
EVALUATION

- Special tests: Joint Position Sense
EVALUATION

- SELF–REPORT MEASURES : OUTCOME MEASURES
HAND THERAPY INTERVENTIONS

RETURN TO PREVIOUS FUNCTION

PATIENT EDUCATION

PHYSICAL AGENTS

ORTHOTIC INTERVENTION

SOFT TISSUE TECHNIQUES

THERAPEUTIC EXERCISE

EDEMA CONTROL

SENSORY RE-EDUC DESENSITIZATION

JOINT MOBILIZATION

HAND THERAPY INTERVENTIONS
HAND THERAPY INTERVENTIONS

- Patient education
- HEP
EDEMA CONTROL

ELEVATION
EDEMA CONTROL

EXTERNAL COMPRESSION:

“CONSISTENCY of light pressure, NOT INTENSITY”
EDEMA CONTROL

EXTERNAL COMPRESSION:

“CONSISTENCY OF LIGHT PRESSURE, NOT INTENSITY”
EDEMA CONTROL

EXTERNAL COMPRESSION:

- External bandages
- Elastic garments
IMPORTANCE OF EDEMA CONTROL

EDEMA  PAIN  IMMObILITY

EDEMA  STIFFNESS  ISCHEMIA

STIFFNESS  FIBROSIS
SPLINTS Vs. ORTHOSES

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ORTHOTIC INTERVENTION

GOALS

- To relieve pain and provide comfort
- To protect and support healing structures.
- To maintain stability
- To prevent deformity
ORTHOTIC INTERVENTION

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GOALS

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ORTHOSES FOR NERVE INJURIES
STATIC PROGRESSIVE ORTHOSES

Stress-relaxation loading

STATIC PROGRESSIVE ORTHOSES

DYNAMIC ORTHOSES
DYNAMIC PROGRESSIVE ORTHOSES

Creep Loading (constant force)

SOFT ORTHOSES


PHYSICAL AGENTS

THERMAL AGENTS
ELECTROTHERAPY
IONTOPHORESIS
PHONOPHORESIS
LASER
THERMAL AGENTS

SUPERFICIAL THERMAL AGENTS

- Vasodilation
- Decreased pain
- Increased tissue extensibility
- Decreased muscle tension
- T° 104-113 °F (40-45 °C)
THERMAL AGENTS

ULTRASOUND

- Benefits of heat?
- Repair of soft (musculoskeletal) tissue following injury

HEAT + STRETCH


CRYOTHERAPY

- Decreases pain
- ↓ Blood flow
- ↓ Metabolic activity
- ↓ Nerve conduction velocity

**ELECTROTHERAPY**

- Pain modulation: TENS

ELECTROTHERAPY

- NEUROMUSCULAR ELECTRICAL STIMULATION (NMES)

IONTOPHORESIS


PHONOPHORESIS

JOINT MOBILIZATION

CLINICAL GROUPS/ PATTERNS

PAIN LIMITING MOTION

COMBINATION OF PAIN AND STIFFNESS

STIFFNESS LIMITING MOTION

PAIN DOMINANT

STIFFNESS DOMINANT
## JOINT MOBILIZATION

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G I</td>
<td>Small amplitude at the beginning of the available range.</td>
</tr>
<tr>
<td>G II</td>
<td>Large amplitude at the resistance-free part of the range.</td>
</tr>
<tr>
<td>G III</td>
<td>Large amplitude up to the limit of the available range.</td>
</tr>
<tr>
<td>G IV</td>
<td>Small amplitude up to the limit of the available range.</td>
</tr>
<tr>
<td>G V</td>
<td>Small amplitude, high velocity thrust at the end of the available range.</td>
</tr>
</tbody>
</table>
JOINT MOBILIZATION

RANGE OF MOTION GOAL
NORMAL Vs. FUNCTIONAL

- Elbow extension / flexion 30-130
- Pronation Supination 50-50
- Wrist flexion 40
- Wrist extension 40
- Ulnar deviation 20
- Radial Deviation 20
- MP flexion 62
- PIP flexion 60
- DIP flexion 39

Morrey, JBJS, 1981
Ryu & Cooney, JHS 1991
Hume & Gellman, JHS 1990
## SUMMARY OF THE EVIDENCE

<table>
<thead>
<tr>
<th>Technique</th>
<th>Stage of Tissue Healing</th>
<th>Treatment Dose</th>
<th>Evidence</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active/assisted Exercise</td>
<td>Inflammatory, fibroplastic, and remodeling</td>
<td>Low dose</td>
<td>Single level 4 case series study (MCP and PIP joints)</td>
<td>Active exercise has a positive effect in the hand, but further higher level evidence is needed</td>
</tr>
<tr>
<td>Passive exercise</td>
<td>Fibroblastic and remodeling</td>
<td>High dose</td>
<td>Three studies, all relating to shoulder (level 2b, 3, and 4)</td>
<td>Passive exercise has a positive in the shoulder. Hand-specific research needed</td>
</tr>
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## Summary of the Evidence

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<tr>
<td>Casting motion to mobilize stiffness</td>
<td>Remodeling/chronic joint stiffness</td>
<td>Low to moderate dose according to frequency of motion repetition</td>
<td>Level 5 expert opinion. No research articles to date</td>
<td>Research needed to evaluate effectiveness</td>
</tr>
<tr>
<td>Mobilizing splinting</td>
<td>Fibroplastic and remodeling</td>
<td>Varying dose according to length of time splint used</td>
<td>Ten articles (2 level 2b, 8 level 4). Five articles relating to elbow, 2 relating to wrist, and 3 relating to hand</td>
<td>Highest level of evidence of all techniques</td>
</tr>
</tbody>
</table>
SENSORY RE- EDUCATION
DESENSITIZATION
SPECIAL TECHNIQUES

• ASTYM
SPECIAL TECHNIQUES

- MIRROR THERAPY
SPECIAL TECHNIQUES

• KINESIOTAPE